6.1 CA725

Documentation of Environmental Indicator Determination
Part 111/RCRA Corrective Action
Interim Final 2/5/99
Environmental Indicator (EI) RCRIS Code (CA 725)

Current Human Exposures Under Control

Facility Name: Johnson Controls
Facility Address Fowlerville, Michigan
Facility EPA ID# MID-099-124-299

1. Has **all** available relevant/significant information on known and reasonable suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC), been **considered** in this EI determination?

   X If yes – check here and continue with #2 below.

   __ If no – re-evaluate existing data, or

   __ If data are not available skip to #6 and enter "IN" (more information needed) status code.

The Johnson Controls Inc. (JCI) site in Fowlerville, Michigan currently exists as a relatively flat grassy field. Surface runoff from the site discharges into the Red Cedar River. Groundwater flow at the site is to the west and discharges into the Red Cedar River. The site is bordered by commercial/light industrial properties to the north and east, a railroad track to the south, the Red Cedar River to the west, and wetland/floodplain areas to the northwest. No remediation systems are present at the site. No structures or buildings of any type are located on the site. The site is fenced.

During the summer and fall of 2003, contaminated soils were removed because they could potentially result in unacceptable exposures. Interim action resulted in the removal and appropriate disposal of approximately 83,900 tons of contaminated soil, verification sampling and analyses to confirm removal, and backfilling of excavated areas with clean fill material. Excavation proceeded to the water table at approximately 95% of the excavation areas. Excavation depths ranged from 4 to 8 feet, depending on the depth of the water table. Figure 1 shows the boundary of the excavation. Both the north ditch and the south ditch, which drain into the Red Cedar River, were excavated and backfilled with clean fill material.

All soil, groundwater, surface water, and sediment data collected from areas not excavated during interim action have been considered in preparing this document. Sampling locations are identified in Figures 1 through 4.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under" Control EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land and groundwater use conditions (for all "contamination" subject to RCRA Corrective Action at or from the identified facility (i.e., site-wide).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program, the EIs are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, or GPRA. The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land and groundwater use conditions ONLY, and do not consider potential future land or groundwater use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and ground water uses, and ecological receptors).

Duration/Applicability of EI Determinations

EI Determinations status codes should remain in the RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary Information).

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **"contaminated"** above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

	Yes	No	?	Rationale/Key Contaminants
Groundwater	X			Chemicals exceeded criteria (see below)
Air (indoors) (2)		X		No exceedances were noted (see below)
Surface Soil (e.g., <2 ft)	X			Chemicals exceeded criteria (see below)
Surface Water		X		No exceedances were noted (see below)
Sediment	X			Chemical exceeded criteria (see below)
Subsurface Soil	X			Chemicals exceeded criteria (see below)
Air (outdoors)		X		No exceedances were noted (see below)

_____ If no (for all media), skip to #6, and enter "YE" status code after providing or citing appropriate levels, and referencing sufficient supporting documentation demonstrating that these levels are not exceeded.

___X___ If yes (for any media), continue after identifying key contaminants in each "contaminated" medium. Cite appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

_____ If unknown (for any media)-skip to #6 and enter an "IN" status code.

Rationale and Reference(s):

For groundwater, air (indoors), surface soil, surface water, subsurface soil, and air (outdoors), applicable criteria are the MDEQ Part 201 generic cleanup levels (Part 201 of Michigan Public Act 451. The report entitled "Human Health Environmental Indicators Support Document" (ETW 2003) contains further information concerning the criteria, site-specific criteria development, and criteria comparisons. For sediments, the sampling results were compared with the screening values presented in the EPA's National Sediment Quality Survey.

Groundwater

The applicable generic groundwater Part 201 criteria used include groundwater contact criteria; groundwater surface water interface (GSI) human-health based criteria; groundwater residential drinking water criteria; and groundwater volatilization to indoor air criteria.

Groundwater concentrations exceeded the most stringent of the applicable criteria in many of the samples taken from on-site monitoring wells and a few off-site wells near the facility. Groundwater contains chemicals at levels in excess of residential drinking water criteria, including 1,1-dichloroethene, cis-1,2-dichloroethene, methylene chloride, trans-1,2-dichloroethene, trichloroethene (TCE), vinyl chloride, arsenic, cadmium, lead, nickel, and cadmium (dissolved). Off-site groundwater chemicals exceeding criteria include TCE at Geoprobe borings OE-2 and OE-3, which are immediately upgradient of the east property line and vinyl chloride in MW-OS3, which is adjacent to the Red Cedar River (see Figure 2A). Groundwater is contaminated at levels in excess of residential drinking water, and GSI for human health (GSI-HH) criteria (i.e., ingestion routes only), and GSI criteria for TCE and vinyl chloride. Chemicals in groundwater that exceed generic GSI criteria include cis-1,2-dichloroethene, TCE, vinyl chloride, arsenic, cadmium (total and dissolved), copper, lead, nickel, cyanide-free, and hexavalent chromium (dissolved) (see Figure 2). Therefore, groundwater is considered "contaminated."

Soil

The applicable generic Part 201 soil criteria used includes soil residential drinking water protection; soil GSI protection; soil GSI protection-human health based; soil infinite volatilization; soil particulate inhalation; soil industrial/commercial II direct contact; and soil statewide default background. Surface soil and subsurface soil concentrations in approximately 130 subsurface soil samples and 110 surface soil samples exceeded the most stringent of the applicable criteria. Chemicals in surface soil having concentrations above comparison criteria include: arsenic, methylene chloride, TCE, and total cyanide (residential drinking water protection); arsenic, fluoranthene, hexavalent chromium, copper, mercury, selenium, silver, cyanide, and zinc (soil GSI protection); arsenic, fluoranthene, pyrene, copper, lead, mercury, and zinc (soil GSI protection-human health based); and arsenic (industrial/commercial II soil direct contact). Chemicals in subsurface soil having concentrations above comparison criteria include: arsenic, methylene chloride, and TCE (residential drinking water protection); arsenic, hexavalent chromium, selenium, silver, mercury, cyanide and zinc (soil GSI protection); and arsenic, lead, mercury,

and zinc (soil GSI protection-human health based). Therefore, surface and subsurface soil are considered "contaminated."

Surface Water

The generic Part 201 GSI-HH criteria are the MDEQ's human health criteria for non-drinking water surface water bodies and include incidental ingestion of chemicals that may occur during recreational activities such as swimming and ingestion of fish exposed to the water. The concentrations of chemicals in surface water samples did not exceed these criteria. Therefore, surface water is not considered "contaminated."

Sediment

The concentrations of chemicals in sediment samples were compared with the MDEQ's Part 201 residential soils direct contact screening criteria. The maximum detected concentration of polychlorinated biphenyls (11,000 ppb) exceeds this criteria.

Air

While indoor and outdoor air samples were not collected, soil and groundwater concentrations were compared to Part 201 generic criteria for groundwater volatilization to indoor air, soil infinite volatilization to outdoor air, and outdoor soil particulate inhalation. Furthermore, there are no buildings on the property and interim actions removed contaminated surface and subsurface soils. No exceedances of criteria were noted for air (indoors) and air (outdoors). Therefore, air indoors and outdoors is not considered "contaminated."

Footnotes:

(1) "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).
(2) Recent evidence (from the Colorado Dept. of Public Health and Environment and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonable certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

3. Are there **complete pathways** between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table

Potential **HUMAN RECEPTORS** (under current conditions)

Contaminated Media	Residents	Workers	Day Care	Construction	Trespassers	Recreation	Food
Groundwater	No	No	No	Yes			No
~~Air (indoors)~~	____	____	____				
Surface Soil (e.g., <2 ft)	No	No	No	Yes	Yes	No	No
~~Surface Water~~	____	____			____	____	____
Sediment	No	No	No	No	No	Yes	Yes
Soil (e.g., > 2 ft)				Yes			No
~~Air (outdoors)~~	____	____	____	____	____		

Instructions for Summary Exposure Pathway Evaluation Table:

1. Strike-out specific Media including Human Receptors' spaces for media which are not "contaminated" as identified in #2 above.

2. Enter "yes" or "no" for potential "completeness" under each "Contaminated" Media – Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media – Human Receptor combinations (Pathways) do not have check spaces ("___"). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

_____ If no (pathways are complete for any contaminated media-receptor combination)- skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium. (e.g. use optional Pathway Evaluation Work Sheet to analyze major pathways).

__X__ If yes (pathways are complete for any "Contaminated" Media-Human-Receptor combination)-continue after providing supporting explanation in the rationale and references box below.

_____ If unknown for any ("Contaminated Media-Human Receptor combination"), skip to #6 and enter an "IN" status code.

Rationale and Reference(s):

Air indoors, air outdoors, and surface water are not "contaminated" per Question 2. Therefore, complete exposure pathways for these media are not addressed. For the remaining media (i.e., groundwater, surface soil and subsurface soil), several exposure pathways are not complete because no receptor is present. Residents, workers, and day care facilities are not exposed to contaminated media because these receptors are not present on the site. Exposure through food sources is not complete because gardens and livestock are not present on the property. Thus, the on-site residents, workers, day care, recreation, air (indoor and outdoor), and surface water contaminated media are not complete exposure pathways.

Sediments

The adjacent Red Cedar River is small and not attractive for swimming or other recreational activities. There is no indication that it supports a significant sport fishery (e.g., observation of fishing activity, lost fish lines, bait shops, marinas, etc.). While there may be occasional recreational activity such as swimming or canoeing, the river is too small to support regular recreational activities. There are no swimming beaches or canoe liveries nearby, and the river is not a public water supply. Recreational exposure to surface water and sediments may occur. Recreational exposure to food (fish from the river) may occur.

Groundwater

Groundwater on site is not used for any purpose, including drinking. JCI is establishing groundwater use restrictions for the property. There is no known use of groundwater to the east, north or south of the site and these areas are served by the municipal water supply. There is a house approximately 950 feet west of the site across the river that uses groundwater. The house is located 850 feet upgradient of the known impacted monitoring well on the west side of the river and no impacts were observed in a shallow and deep monitoring cluster located between the house and the site. Thus, residential use of groundwater is not a complete exposure pathway.

Shallow groundwater is present at a depth of 4 to 8 feet below ground surface. Construction workers may indirectly contact this groundwater during excavation activities. Thus, this direct contact pathway is potentially complete for construction workers.

Surface and Subsurface Soil

The property is currently inactive open land with no buildings or operations except for environmental investigation and remediation activities. Although no construction activities are currently on-going, construction workers may be exposed to residual on-site contaminated surface and subsurface soils. There is a potential for trespassers to enter the property by climbing the fence that surrounds the site. These trespassers may be exposed to residual on-site contaminated surface soil.

The following exposure pathways between "contamination" and human receptors are potentially complete and can reasonably be expected with the current use of land and groundwater:

- Construction workers may be exposed to on-site contaminated surface soil;
- Trespassers may be exposed to on-site contaminated surface soil;
- Construction workers may be exposed to contaminated subsurface soil during excavation activities; and
- Construction workers may be exposed to contaminated groundwater during excavation activities;
- Recreational users of the Red Cedar River might be exposed to direct contact with contaminated sediments, and through consumption of fish that might have become contaminated through bioaccumulation of contaminants in the sediments.

The report entitled "Human Health Environmental Indicators Support Document" (ETW 2003) contains further information concerning inclusion and exclusion of exposure pathways.

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **significant** (4) (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency, and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks?

___X__ If no (exposures cannot be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant".

_____If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" identified in #3) are not expected to be "significant".

_____If unknown (for any complete pathway), skip to #6 and enter "IN" status

Rationale and Reference(s):

All exposures from the pathways identified in #3 are considered insignificant. The following is a brief summary of the insignificant exposure pathway rationale. The report entitled "Human Health Environmental Indicators Support Document" (ETW 2003) contains further information concerning the significance of exposure pathways.

The owners of the site or representatives of the owners control access to the site, and the site is fenced. Exposure of construction workers to on-site residual contaminated surface and subsurface soil is not currently significant because such exposures are carefully controlled and limited by an existing health and safety program that all construction workers on site follow. Any construction activities not related to remedial activities, such as utility maintenance, are also required to follow appropriate health and safety procedures. While arsenic was detected in surface soil exceeding industrial/commercial II direct contact criteria (37 mg/kg) at three discrete sample locations at concentrations ranging from 40 to 44 mg/kg, the 95 percent upper confidence limit (95UCL) average concentration of arsenic in surface soil (14.07 mg/kg) is below this generic direct contact criteria. No chemicals were detected in subsurface soil at concentrations exceeding the default criteria for direct contact with soil. Other soil criteria that were exceeded (e.g., GSI protection human-health based) do not apply to construction workers. Therefore, exposure of construction workers to surface and subsurface soil is considered insignificant.

While a construction worker may come in direct contact with shallow groundwater during excavation activities, exposure of construction workers is not currently significant because such exposures are carefully controlled and limited by an existing health and safety program that all construction workers on site follow. In addition, no chemicals in groundwater exceeded Part 201 generic criteria for direct contact with groundwater. Thus, exposure of construction workers to contaminated groundwater is not currently significant.

While access to the site is controlled and the site is fenced, individuals might trespass on the property. Trespassers are not likely to engage in activities that could result in significant exposure, nor are trespassers likely to remain long on the site or trespass only in areas where concentrations of chemicals in soil exceed criteria. In addition, exposure of a trespasser is expected to be less than the exposure of an industrial/commercial worker, and industrial direct contact soil criteria have not been exceeded. Thus, exposure of trespassers to on-site contaminated surface soil is not currently significant for these reasons.

For sediment, site-specific, human health-based criteria for direct contact for all the contaminants of concern and consumption of PCB-contaminated fish were developed following MDEQ Part 201 protocol and U.S. EPA guidance. No exceedances of criteria were noted for sediment.

5. Can the significant **exposures** (identified in #4) be shown to be within **acceptable** limits?

____If yes (all significant exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

_____If no, (there are current exposures that can be reasonably expected to be unacceptable) continue and enter the "NO" status code after providing a description of each potentially "unacceptable" exposure.

_____If unknown (for any potentially "unacceptable" exposure), continue and enter "IN" status code.

Rationale and Reference(s):

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA 725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (reference appropriate supporting documentation as well as a map of the facility):

___X___YE = yes, "Current Human Exposures under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the ___Johnson Controls facility, EPA ID #MID-099-124-299 located at Fowlerville, Michigan, under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

_____NO = "Current Human Exposures" are NOT "Under Control".

_____IN = More information is needed to make a determination.

All exposures have been controlled as required by the human health risk-based definitions specified in CA 725.

Current Human Exposures Under Control
Environmental Indicator (EI) RCRIS code (CA725)

Completed by _____ Date: 3/31/2004

Supervisor _____ Date 3-31-04
George J. Hamper
Chief CA Section
312-886-0987

Locations where References may be found: The report entitled "Human Health Environmental Indicators Support Document" (ETW 2003) contains further information. A copy can be found at:

U.S. EPA Region 5
RCRA Records Center – 7th Floor
77 West Jackson Boulevard
Chicago IL 60604

Contact telephone and e-mail numbers:

(Name) Juan Thomas
(Phone #) 312-886-6010
(E-mail) Thomas.juan@epa.gov

Final Note: The Human Exposure EI is a Qualitative Screening of exposures and the determinations within this document should not be used as the sole basis for restricting the scope of more detailed (e.g. site-specific) assessments of risk.